Institute of Social and Economic Research
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Web Notes

Managing Alaska's Petroleum Nest Egg for Maximum Sustainable Yield

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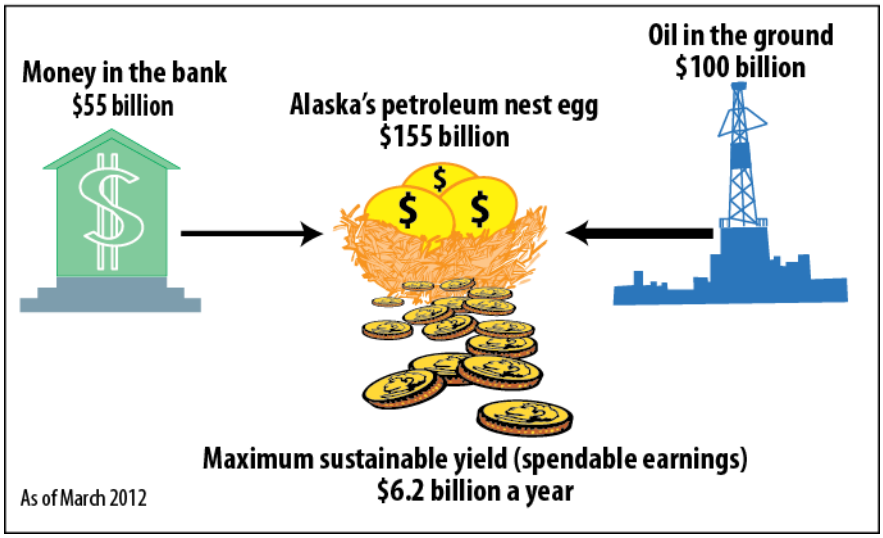
SUMMARY

• ***The state government relies almost entirely on non-sustainable petroleum revenues*** to pay for public services.

• ***The size of the state's Petroleum Nest Egg—the value of revenues from oil and gas yet to be produced as well as money already in the bank***—is hard to estimate and fluctuates from year to year, but based on current information it is about $155 billion.

• ***That nest egg could generate a sustainable flow of $6.2 billion a year*** in spendable earnings.



• ***But spending from the nest egg in FY 2012 is likely to be $7 billion***—$.8 billion more than is sustainable, including spending for both public services and Permanent Fund dividends.

FY 2012 Nest Egg Spending (Billion $)*	**$7.0**
General Fund Petroleum Revenues**	**$6.2**
General Fund Earnings	**$0.2**
Permanent Fund Dividends	**$0.65**

* Categories do not sum to total due to rounding.
** GF Petroleum Revenues are projected to be $8.2 billion in FY 2012. The state could spend $5.35 billion of that without compromising its future ability to provide the current level of public services.

• ***That spending above the sustainable level in FY 2012 means Alaskans are passing on a $.8 billion fiscal burden*** to future generations and similarly reducing the size of the nest egg.

• ***The fiscal burden will grow every year and the nest egg will shrink at an accelerating pace,*** until the state reduces spending or finds an alternative source of revenue.

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Northrim Bank

INTRODUCTION

Web Note #7 (*How Much Should Alaska Save?* February 2011) suggested we should think of Alaska's petroleum wealth as an asset from which we should spend only the earnings—thus preserving that wealth for future generations, while at the same time providing a sustainable annual flow of income for current Alaskans.

Based on the value of state financial assets and a projection of future petroleum revenues, in early 2011 we estimated total petroleum wealth—the **Petroleum Nest Egg**—to be $126 billion. That total could generate an annual sustainable flow of income, or **Maximum Sustainable Yield**, of $5 billion.

That year actual state spending from petroleum revenues, along with the Permanent Fund dividend, was $5.5 billion, or $.5 billion more than the sustainable amount. This put a **Fiscal Burden** on future generations of Alaskans because it reduced the size of the nest egg. The state could have avoided that burden either by increasing non-petroleum revenues $.5 billion, or by reducing spending that much. Doing one or the other would have added $.5 billion of saving to the nest egg and so maintained its value.

This Web Note revisits the calculation of the Petroleum Nest Egg, the Maximum Sustainable Yield, and the Fiscal Burden, taking into account both changes in expectations of future revenues and the size of the state budget. The estimated size of the nest egg has increased since last year, to $155 billion, because of higher oil prices and more optimistic production assumptions, so the estimated sustainable yield is up to $6.2 billion a year. But that growth has been more than offset because spending of petroleum revenues has also increased. The FY 2012 state budget exceeds the Maximum Sustainable Yield by $.8 billion, passing a Fiscal Burden of that amount on to the next generation of Alaskans.

Looking beyond FY 2012, continued spending growth would have dramatic effects on the Nest Egg and Sustainable Yield. For example, if spending growth of 6% a year were to go on year after year and the growth was funded by petroleum revenues, the currently estimated Nest Egg would shrink at an accelerating rate and the Fiscal Burden would grow at an increasing rate. The Maximum Sustainable Yield for the next generation of Alaskans would drop by half in 20 years.

Looked at another way, sustaining spending growth of 6% a year would require a Nest Egg of $350 billion—more than twice the current estimate. To put that amount in perspective, $350 billion is more than half the current size of the Norwegian government's pension fund.

TRACKING STATE FISCAL PERFORMANCE

The state produces an annual fiscal report, but it looks ahead only a decade and treats petroleum revenues as annual income, rather than as the proceeds from the sale of an asset. Consequently, the report presents an unrealistic picture of the fiscal condition of the state—and that is why a different method of tracking state fiscal performance is necessary. (See *Revising the State Fiscal Plan to Account for Petroleum Wealth*, Web Note #9, May 2011)

Tracking state fiscal performance is a simple three-step process, based on the fact that petroleum—which directly accounts for 92% of state general fund spending in the FY 2012 budget—is a non- sustainable revenue source.[1]

The first step is estimating the value of the Petroleum Nest Egg (or portfolio of petroleum wealth) and the Maximum Sustainable Yield it can generate. The second step is calculating actual state spending from the Petroleum Nest Egg. The last step is comparing actual spending to the Maximum Sustainable Yield. If spending is less than the Maximum Sustainable Yield, the state fiscal condition is sound. But spending above the Maximum Sustainable Yield is a cause for concern. It means the state will be unable to sustain spending at the current rate from the Petroleum Nest Egg and is creating a Fiscal Burden for the future.

The Petroleum Nest Egg

The size of the Petroleum Nest Egg depends on the combined value of two accounts—Money in the Bank and Petroleum in the Ground.

The financial accounts (Money in the Bank) consist of state funds built from past petroleum revenues. The largest of these accounts are the Permanent Fund, the Constitutional Budget Reserve, the Statutory Budget Reserve, and the balance in the state General Fund beyond the amount needed to meet the cash flow requirements of the state and other commitments. The balances in these funds can be found on the websites of the Permanent Fund Corporation and the Alaska Department of Revenue.

At the end of calendar year 2011, the combined balance in these funds was about $55 billion (Table 1). That was an increase of $10 billion from the year before, due to a combination of a significant recovery in value of the Permanent Fund and higher than anticipated petroleum revenues deposited in the various state financial accounts.

Table 1. Money in the Bank (Billion $)

	TODAY	LAST YEAR
TOTAL	**$55**	**$45**
Permanent Fund	$40	$33
Constitutional Budget Reserve	$12	$9
Statutory Budget Reserve	$1	$1
General Fund	$2	$2

The Petroleum in the Ground account is all the revenue the state will collect (taxes and royalties) in the future from production of oil and gas that is still in the ground. Unfortunately, no department of state government keeps track of the size of this account so it has to be estimated from other sources and assumptions about the future.

The Alaska Department of Revenue produces an annual projection of state petroleum revenues covering the next decade; the projection is on the department's website. At the end of calendar year 2011, the Department of Revenue projected, based on unknown future prices and

[1]Current petroleum revenues and earnings of funds bankrolled by petroleum revenues collected in former years. If revenues INDIRECTLY attributable to petroleum-- like a portion of the corporate income tax--were included, the share of spending funded by petroleum would be higher.

production, that the state would collect $74 billion in petroleum revenues (including Permanent Fund deposits) from FY 2012 (July 1, 2011 through June 30, 2012) through FY 2021.

But because a dollar of revenue received in the future has less value than a dollar collected today (a bird in the hand is worth two in the bush), the present value, or the **Bankable Value**, of that flow of revenues is $51 billion (Table 2). This is the amount of money the state could realize today if it could sell its right to receive the future flow of revenues projected by the Department of Revenue. (Future revenues are discounted at the expected rate of interest that money in the bank could earn.[2]) The Bankable Value of this flow of future petroleum revenues is $6 billion higher today than it was last year.

Table 2. Future Petroleum Revenues, 2012-2021, Projected by the Alaska Department of Revenue (Billion $)

	TODAY	LAST YEAR
Total Future Revenues	$74	$66
Bankable Value (NPV)	**$51**	**$45**

Anticipated revenues from oil and gas production further in the future are not included in the Department of Revenue report, but the report does give an estimate of recoverable oil remaining in the ground today—about 4.5 billion barrels. Together with assumptions about the trend in production (declining 5.5 percent annually) and state revenue "take" per barrel (constant in nominal dollars at $40[3]), we can use that estimate to project revenues beyond FY 2021. Estimated revenues from FY 2022 through FY 2050 total $93 billion, with a Bankable Value of $22 billon. The Bankable Value of these revenues is a small percentage of annual revenues because those revenues are discounted over many years. (Appendix A shows an example of how the discounted present value of revenues falls as those revenues are realized further in the future.)

Combining these two estimates ($51 billion and $22 billion) puts the total Bankable Value of known conventional oil on state lands at an estimated $73 billion. However, that estimate excludes potential new reserves of conventional oil on state lands, most potential viscous and heavy oil production, all shale oil production, most production from the National Petroleum Reserve Alaska (NPRA),all production from the Arctic National Wildlife Refuge (ANWR) and the Outer Continental Shelf (OCS), and all commercial natural gas production.

It is likely that the production of conventional oil from state lands on the North Slope will ultimately exceed the Alaska Department of Revenue projection of known reserves. Extensions in existing fields, development of known fields not currently producing, and new discoveries could add 2 billion barrels to production through 2050. If the yield on this oil were $25 per barrel (compared to $40 on current reserves), the bankable value of this oil could be $4 billion.

Viscous and heavy oil will be technically challenging and expensive to produce, but the industry is already bringing some of this oil to market. If production not included in the Department of

[2] A real discount rate of 5% is used in this calculation.

[3] Constant "take" assumes that future production costs will increase to offset future price increases.

Revenue projection could be 1.5 billion barrels through 2050 with a revenue yield of $20 per barrel, its bankable value today could be $4 billion.

It is not yet known whether shale oil production will be technically feasible in Alaska, and if it is, it will face significant environmental challenges. If these challenges could be overcome and production were 1.5 billion barrels through 2050 with a yield of $20 per barrel, its bankable value today could be $4 billion.

The oil potential in NPRA has recently been dramatically revised downward and the bankable value of production is included in the Department of Revenue projection.

Production from the federal Outer Continental Shelf (OCS) would create employment but would not produce royalties or production tax revenue for the state. If production eventually rose to 400 thousand barrels per day, the bankable value of that production today for the state would be about $1 billion (property and corporate income taxes).

Opening ANWR to development could generate significant revenues for the state, but the refuge is currently off limits.

Estimates of the potential revenues from development of North Slope natural gas resources vary considerably. For simplicity in this analysis we assume gas is commercialized early in the next decade and reaches a sustained daily production level of 4.5 bcf (billion cubic feet). If the yield for the state is $1.50 per mcf (million cubic feet) when production starts, and it increases with inflation over time, then the bankable value of this production would be about $12 billion.

Taking all these estimates together produces a total bankable value of petroleum in the ground of $100 billion at the end of 2011, up from an estimated $81 billion a year earlier (Table 3). This increase is due both to a higher projection of future petroleum revenues by the Department of Revenue and more optimistic estimates of revenues from unconventional oil production. (Detailed revenue projections are contained in Appendix B.)

Table 3. Future Petroleum Revenues—Bankable Value (Billion $)

	TODAY	LAST YEAR
TOTAL BANKABLE VALUE	**$100**	**$81**
Department of Revenue (DOR)	$51	$45
Extrapolation of DOR	$22	$27
Additions to Conventional Oil	$6	
Viscous/Heavy Oil	$4	$1
Shale Oil	$4	
OCS	$1	$1
Natural Gas	$12	$7
NPRA	-	-
ANWR	-	-

At the end of 2011, the Petroleum Nest Egg was $155 billion, consisting of $55 billion of money in the bank and $100 billion of oil revenues in the ground. This was $29 billion higher than the estimate from a year earlier (Table 4).

Table 4. The Alaska Petroleum Nest Egg (Billion $)

	TODAY	LAST YEAR
TOTAL	**$155**	**$126**
Financial Accounts	$55	$45
Petroleum in the Ground	$100	$81

Maximum Sustainable Yield (MSY)

A Petroleum Nest Egg of $155 billion could generate $7.8 billion of spendable earnings each year and never fall in value.[4] But because Alaska's population is growing, the Petroleum Nest Egg has to grow at the same rate, in order to generate constant per capita spendable earnings.

Taking annual population growth of 1% into account, the Maximum Sustainable Yield from a $155 billion Petroleum Nest Egg would be $6.2 billion, or $8,525 per capita, for FY 2012 (Table 5).[5] This level of real per capita spending from the Nest Egg could be sustained in perpetuity. In contrast, last year's estimate of Maximum Sustainable Yield was $5 billion, or $7,100 per capita.

Table 5. Maximum Sustainable Yield (MSY)

	TODAY	LAST YEAR
Petroleum Nest Egg (Billion $)	$155	$126
MSY (Billion $)	**$6.2**	**$5.0**
Population (000)	729	710
Per Capita Nest Egg (Thousand $)	$213	$177
MSY Per Person	**$8,525**	**$7,100**

Spending from the Petroleum Nest Egg

Spending from the Petroleum Nest Egg consists of that share of current petroleum production revenues (taxes and royalties) that the state spends through the General Fund, as well as any financial earnings or balances spent. This includes General Fund, Permanent Fund, and Budget Reserve spending.

General Fund spending paid for by petroleum is total spending minus non-petroleum revenues. As reported on the Office of Management and Budget website, General Fund spending for FY 2012 is projected to be $6.88 billion, with $.54 billion paid for by non-petroleum sources. The remainder, $6.34 billion, will be paid for with investment earnings of $.18 billion and $6.17 billion out of the total of $8.22 billion the state expects to collect in General Fund petroleum revenues. The rest of current General Fund petroleum revenues, $2.05 billion, would be left to accumulate in various financial accounts (Table 6).

[4] Based on a real rate of return of 5%, which is the target rate of return for the Alaska Permanent Fund.

[5] The Petroleum Nest Egg needs to grow at the same rate as population, which has been averaging about 1% annually. So of total real earnings of 5%, 1% must be reinvested. This leaves 4% for current spending.

Table 6. Sources of General Fund Spending (Billion $)

	TODAY*	LAST YEAR
TOTAL GF SPENDING	**$6.88**	**$5.28**
Minus: Non-Petroleum Revenues	$ .54	$ .49
Equals GF SPENDING FROM PETROLEUM	**$6.34**	**$4.79**
Investment Earnings	$ .18	$ .20
Petroleum Production Revenues	$6.17	$4.60
Item: GF PETROLEUM PRODUCTION REVENUES	$8.22	$5.06
Spent thru GF	$6.17	$4.60
Saved	$2.05	$ .46
* FY 2012.		

The Permanent Fund dividend is the only significant spending from financial accounts (except the earnings of the General Fund, as noted above). The Permanent Fund Corporation projects the amount of income that will fund the dividend in the fall of 2012, and reports that estimate in its monthly report. The estimate in early 2012 was $.65 billion.

Combining General Fund spending from petroleum and projected dividend spending, total spending from the Petroleum Nest Egg for FY 2012 is projected to be $6.99 billion (Table 7)—$9,600 per capita. This compares with $5.54 billion, or $7,800 per capita from a year ago.

Table 7. Spending from the Petroleum Nest Egg (Billion $)

	TODAY	LAST YEAR
TOTAL NEST EGG SPENDING	**$6.99**	**$5.54**
GF SPEND	$6.34	$4.79
Petroleum Production Revenues	$6.17	$4.60
Investment Earnings	$ .18	$ .20
PF Dividend	$ .65	$ .75

Measuring Fiscal Performance

That projected spending of $6.99 billion from the Petroleum Nest Egg for FY 2012 exceeds the estimated Maximum Sustainable Yield of $6.2 billion by $ .8 billion ($1,100 per capita)—so the state is not saving enough to preserve its Petroleum Nest Egg. Spending from the Petroleum Nest Egg would need to be 13% lower to restore balance and prevent erosion in the value of the Nest Egg (Table 8). (See Appendix C for details.)

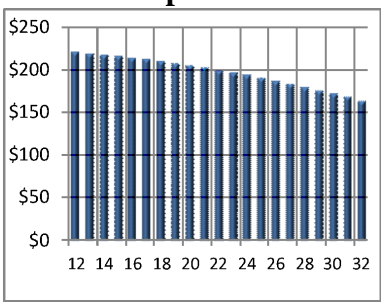
Table 8. Erosion of the Petroleum Nest Egg

	Billion $			Per Capita	
	TODAY	**LAST YEAR**		**TODAY**	**LAST YEAR**
MSY	$6.2	$5.00		$8,525	$7,000
SPENDING	$6.99	$5.54		$9,600	$7,800
% over MSY	13%	11%		13%	11%
EROSION of NEST EGG					
Amount	**$.80**	$.54		**$ 1,100**	$ 800
%	.5%	.4%		.5%	.4%

Interpretation

The amount of wealth erosion for FY 2012, $.8 billion, is small compared with the size of the Petroleum Nest Egg, and could easily be eliminated by an increase in non-petroleum revenues, or a reduction in spending from the FY 2012 General Fund budget. It could also be eliminated if the Nest Egg were to suddenly increase by $20 billion[6]. But without such a correction, the shortfall would grow in future years as the Petroleum Nest Egg shrank—and with it the Maximum Sustainable Yield. The rate of erosion would accelerate from less than 1% annually to nearly 3% after 20 years. The per capita Nest Egg would fall from $213 thousand to $160 thousand (Figure 2).

Figure 2. Projected Erosion of Petroleum Nest Egg Per Capita (Thousand 2012 $)
(At Constant Real Per Capita General Fund Spending)

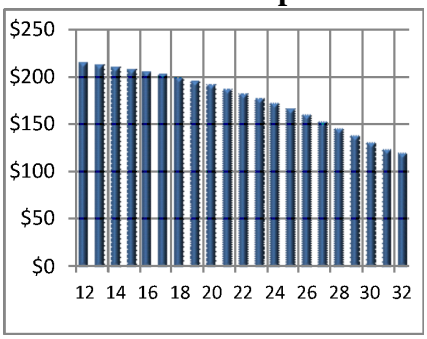


The increase in the estimated size of the nest egg from last year to this year did not improve the fiscal condition of the state because state spending increased by a larger proportion. If state General Fund spending were to continue its current growth trend, erosion of the Petroleum Nest Egg would be much faster. For example, if real General Fund spending were to grow at just over 2% annually (a 6% nominal growth rate, assuming inflation of 2.75% and population growth of 1%), the per capita Nest Egg would be cut in half by 2032 (Figure 3).[7]

[6] At a 4% real rate of return $20 billion could generate sustainable earnings of $.8 billion.

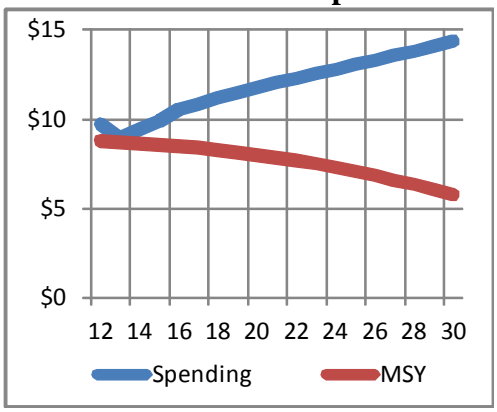
[7] This assumes the FY 2013 budget is $6.4 billion as proposed by the governor. If the budget turns out to be higher, then the erosion would be greater.

Figure 3. Projected Erosion of Petroleum Nest Egg Per Capita (Thousand 2012 $)
(At 2% Annual Growth in Real Per Capita General Fund Spending)



At that level of growth in General Fund spending, the Fiscal Burden (the gap between petroleum-related spending and the Maximum Sustainable Yield from the nest egg) would open and grow over time. By 2030, nearly two-thirds of all spending would be a Fiscal Burden passed forward to the next generation (Figure 4).

Figure 4. The Growing Fiscal Burden Gap Per Capita (Thousand 2012 $)
(With 2% Annual Growth in Real Per Capita General Fund Spending)



DEALING WITH UNCERTAINTY

Through the first part of FY 2012 petroleum revenues have been higher than the Alaska Department of Revenue projected in December due to the high oil price. Furthermore the FY 2012 supplemental budget has not been finalized. So when FY 2012 general fund petroleum revenues and spending are finalized, the Fiscal Burden could be higher or lower than the $.8 billion currently projected. Table 9 shows that the size of the Fiscal Burden does not change much if revenues for the year are higher or lower than anticipated. However the burden is quite sensitive to higher or lower general fund spending.

Table 9. FY 2012 Fiscal Burden Sensitivity to GF Petroleum Revenues and GF Spending (Billion $)

		GF Petroleum Revenues (Billion $)				
GF Spend (Billion $)		**$6.0**	**$7.0**	**$8.2**	**$9.0**	**$10.0**
	$6.0	$.02	-$.02	-$.07	-$.10	-$.14
	$6.3	$.27	$.23	$.18	$.15	$.11
	$6.5	$.52	$.48	$.43	$.40	$.36
	$6.9	$.90	$.86	**$.81**	$.78	$.74
	$7.0	$1.02	$.98	$.93	$.90	$.86
	$7.3	$1.27	$1.23	$1.18	$1.15	$1.11
	$7.5	$1.52	$1.48	$1.43	$1.40	$1.36

The Size of the Nest Egg

The estimated size of the Petroleum Nest Egg is 23% higher today than it was a year ago because of an unusually high return on the Permanent Fund and revised perceptions about future oil prices and production.

This jump in value underscores the inherent uncertainty that any state fiscal planning strategy must deal with, as long as the state depends on petroleum revenues. The advantage of the Maximum Sustainable Yield approach is that it explicitly recognizes and takes into account the non-sustainability of petroleum revenues. It is better to have an uncertain estimate of the size of the finite resource than to assume the resource is infinite.

The estimated value of the Petroleum Nest Egg is sensitive to the assumptions that drive it—Bankable Revenues and the Investment Rate of Return—so it is important to be careful in estimating those values. (See Appendix D for a sensitivity matrix.) A change in the value of the Petroleum Nest Egg that comes from a change in Bankable Revenues would be cushioned by the fact that some of the Nest Egg is held in financial assets. So a 20% increase in Bankable Revenues today would increase the Nest Egg by only about 13%. On the other hand, a 20% change in the Rate of Return would change the value of the Nest Egg by slightly more than 20%.

Estimates of the value of the Petroleum Nest Egg will continue to move up and down based on changes in market conditions and policy, so no single estimate should guide planning. It is better to consider a range of values calculated over time, such as a moving average, and also to consider the sensitivity of each estimated value.

How Big Does the Petroleum Nest Egg Need to Be?

One way to get around the difficulty of estimating the value of the Petroleum Nest Egg is to calculate how big it would need to be to sustain budget growth under different conditions. If the necessary size of the nest egg were "reasonable," then the budget growth conditions could be considered reasonable. If the necessary size of the nest egg were not reasonable, then the budget growth conditions would be considered unreasonable.

Table 10 contrasts the currently estimated Petroleum Nest Egg with its size considering four different spending scenarios.

The $155 billion nest egg ($55 billion in financial assets and $100 billion of petroleum in the ground) can generate a real per capita Maximum Sustainable Yield of $8,525 today that could be sustained in perpetuity. The spendable earnings would grow about 4% annually to cover inflation and population growth.

The first alternative scenario also assumes that real per capita spending remains constant, but at the higher level of $9,600 anticipated for FY 2012. This spending scenario would be sustainable only if the nest egg were $175 billion, including $120 billion of petroleum in the ground. This is 20% higher than estimated petroleum in the ground from Table 3, but plausible under certain conditions.

But the necessary Nest Egg size increases dramatically if spending from petroleum were to continue to grow. That's because the share of Nest Egg earnings reinvested would need to be larger to keep up with the growth in spending. The three other scenarios in Table 10 assume that there will continue to be real per capita growth in spending, at rates of 1%, 2% or 3% respectively (5%, 6%, or 7% nominal growth).

For example, if spending were to continue to grow at 6% per year (2% real per capita), the Nest Egg would need to be $350 billion, of which $295 billion would be petroleum in the ground. Since that is three times the current estimated value of petroleum in the ground, it is very unlikely that this growth path would be sustainable. And to be sustainable, an annual spending growth rate of 7% would require a nest egg of $700 billion—seven times the current estimated value of petroleum in the ground.

Table 10. Petroleum Nest Egg Required to Sustain Growing State Spending

Spending Scenario	Spending Growth Rate		Necessary Petroleum Nest Egg (Billion $)		Ratio of Necessary to $155 Billion Nest Egg
	Nominal	Real Per Capita	Total	Petroleum in the Ground	
Current MSY estimate ($8,525 per capita)	4%	0%	**$155**	$100	100%
Expected FY 2012 spending ($9,600 per capita)	4%	0%	**$175**	$120	113%
Growing	5%	1%	**$233**	$178	150%
Growing	6%	2%	**$350**	$295	226%
Growing	7%	3%	**$700**	$645	452%

APPENDIX A.

MAXIMUM SUSTAINABLE YIELD FROM PETROLEUM REVENUE STREAMS IN DIFFERENT DECADES AND DISCOUNTED AT DIFFERENT RATES

2%	$0.16	$0.14	$0.13	$0.12	$0.11	$0.10
3%	$0.21	$0.18	$0.16	$0.14	$0.12	$0.10
4%	$0.26	$0.21	$0.17	$0.14	$0.12	$0.10
5%	$0.29	$0.23	$0.18	$0.14	$0.11	$0.09
6%	$0.31	$0.23	$0.17	$0.13	$0.10	$0.07
2010	$ -	$ -	$ -	$ -	$ -	$ -
2011	$ -	$ -	$ -	$ -	$ -	$ -
2012	$ -	$ -	$ -	$ -	$ -	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ -	$ -	$ -	$ -	$ -	$ -
2015	$ -	$ -	$ -	$ -	$ -	$ -
2016	$ 1.00	$ -	$ -	$ -	$ -	$ -
2017	$ 1.00	$ -	$ -	$ -	$ -	$ -
2018	$ 1.00	$ -	$ -	$ -	$ -	$ -
2019	$ 1.00	$ -	$ -	$ -	$ -	$ -
2020	$ 1.00	$ -	$ -	$ -	$ -	$ -
2021	$ 1.00	$ 1.00	$ -	$ -	$ -	$ -
2022	$ 1.00	$ 1.00	$ -	$ -	$ -	$ -
2023	$ 1.00	$ 1.00	$ -	$ -	$ -	$ -
2024	$ 1.00	$ 1.00	$ -	$ -	$ -	$ -
2025	$ 1.00	$ 1.00	$ -	$ -	$ -	$ -
2026		$ 1.00	$ 1.00	$ -	$ -	$ -
2027		$ 1.00	$ 1.00	$ -	$ -	$ -
2028		$ 1.00	$ 1.00	$ -	$ -	$ -
2029		$ 1.00	$ 1.00	$ -	$ -	$ -
2030		$ 1.00	$ 1.00	$ -	$ -	$ -
2031			$ 1.00	$ 1.00	$ -	$ -
2032			$ 1.00	$ 1.00	$ -	$ -
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2044					$ 1.00	$ 1.00
2045					$ 1.00	$ 1.00
2046						$ 1.00
2047						$ 1.00
2048						$ 1.00
2049						$ 1.00
2050						$ 1.00

For example, a revenue stream from 2041 thru 2050, discounted at 5% has a net present value of $1.70. Invested for a 5% rate of return, it could throw off sustainable earnings of $.09.

APPENDIX B.

PROJECTED PETROLEUM REVENUES

5.50% oil decline rate 2.75% Inflation rate 5.00% real rate of return		PETROLEUM REVENUE FROM CONVENTIONAL SOURCES Ak Dept of Revenue Fall 2011 REVENUE SOURCES thru 2021 (shaded data)					
		Wellhead Oil Price	NS Production in Barrels		Revenues ($ million nominal)		
	Fiscal Yr	WTI Nominal	per day (000)	per year (million)	Unrestricted	Restricted	Total
	2010	$ 68.89	652	238	$ 4,913	$ 1,281	$ 6,194
	2011	$ 87.32	613	224	$ 7,049	$ 1,041	$ 8,090
	2012	$ 100.61	585	214	$ 8,215	$ 962	$ 9,177
0	2013	$ 100.91	564	206	$ 7,496	$ 896	$ 8,392
1	2014	$ 100.25	569	208	$ 7,019	$ 905	$ 7,924
2	2015	$ 99.61	545	199	$ 6,313	$ 862	$ 7,175
3	2016	$ 98.23	556	203	$ 6,328	$ 815	$ 7,143
4	2017	$ 96.27	555	203	$ 5,985	$ 746	$ 6,731
5	2018	$ 98.76	550	201	$ 6,363	$ 754	$ 7,117
6	2019	$ 101.19	520	190	$ 6,298	$ 732	$ 7,030
7	2020	$ 103.63	491	179	$ 6,226	$ 709	$ 6,935
8	2021	$ 106.15	462	169	$ 6,130	$ 685	$ 6,815
9	2022		*437*	*159*	*$ 5,734*	*$ 641*	*$ 6,374*
10	2023		*413*	*151*	*$ 5,418*	*$ 605*	*$ 6,024*
11	2024		*390*	*142*	*$ 5,120*	*$ 572*	*$ 5,692*
12	2025		*368*	*134*	*$ 4,839*	*$ 541*	*$ 5,379*
13	2026		*348*	*127*	*$ 4,572*	*$ 511*	*$ 5,083*
14	2027		*329*	*120*	*$ 4,321*	*$ 483*	*$ 4,804*
15	2028		*311*	*113*	*$ 4,083*	*$ 456*	*$ 4,540*
16	2029		*294*	*107*	*$ 3,859*	*$ 431*	*$ 4,290*
17	2030		*278*	*101*	*$ 3,646*	*$ 407*	*$ 4,054*
18	2031		*262*	*96*	*$ 3,446*	*$ 385*	*$ 3,831*
19	2032		*248*	*91*	*$ 3,256*	*$ 364*	*$ 3,620*
20	2033		*234*	*86*	*$ 3,077*	*$ 344*	*$ 3,421*
21	2034		*221*	*81*	*$ 2,908*	*$ 325*	*$ 3,233*
22	2035		*209*	*76*	*$ 2,748*	*$ 307*	*$ 3,055*
23	2036		*198*	*72*	*$ 2,597*	*$ 290*	*$ 2,887*
24	2037		*187*	*68*	*$ 2,454*	*$ 274*	*$ 2,728*
25	2038		*177*	*64*	*$ 2,319*	*$ 259*	*$ 2,578*
26	2039		*167*	*61*	*$ 2,192*	*$ 245*	*$ 2,437*
27	2040		*158*	*58*	*$ 2,071*	*$ 231*	*$ 2,302*
28	2041		*149*	*54*	*$ 1,957*	*$ 219*	*$ 2,176*
29	2042		*141*	*51*	*$ 1,850*	*$ 207*	*$ 2,056*
30	2043		*133*	*49*	*$ 1,748*	*$ 195*	*$ 1,943*
31	2044		*126*	*46*	*$ 1,652*	*$ 185*	*$ 1,836*
32	2045		*119*	*43*	*$ 1,561*	*$ 174*	*$ 1,735*
33	2046		*112*	*41*	*$ 1,475*	*$ 165*	*$ 1,640*
34	2047		*106*	*39*	*$ 1,394*	*$ 156*	*$ 1,550*
35	2048		*100*	*37*	*$ 1,317*	*$ 147*	*$ 1,464*
36	2049		*95*	*35*	*$ 1,245*	*$ 139*	*$ 1,384*
37	2050		*90*	*33*	*$ 1,176*	*$ 131*	*$ 1,308*
38							
SUM 12+				**4,306**	$ 150,408	$ 17,457	$ 167,865
SUM 12-21				1,970	$ 66,373	$ 8,066	$ 74,439
SUM 22-50				2,336	$ 84,035	$ 9,391	$ 93,426
NPV 12+							**$72,989**
NPV 12-21							**$51,182**
NPV 22-50							**$21,807**

5.50%	oil decline rate							
2.75%	Inflation rate	**OTHER MODELED PETROLEUM REVENUE (NOMINAL $)**						
5.00%	real rate of return	OCS	Viscous & Heavy Oil	ANWR	NPRA	Shale Oil	Central NS Conventional	Sum for Model
	Fiscal Yr							use weights to the left
	2010							
	2011	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1	2014	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3	2016	$ -	$ 40	$ -	$ -	$ 40	$ -	$ 79
4	2017	$ -	$ 81	$ -	$ -	$ 81	$ -	$ 163
5	2018	$ -	$ 125	$ -	$ -	$ 125	$ -	$ 251
6	2019	$ -	$ 172	$ -	$ -	$ 129	$ -	$ 301
7	2020	$ -	$ 221	$ -	$ -	$ 177	$ -	$ 397
8	2021	$ -	$ 272	$ -	$ -	$ 227	$ 249	$ 748
9	2022	$ -	$ 326	$ -	$ -	$ 280	$ 384	$ 990
10	2023	$ -	$ 383	$ -	$ -	$ 335	$ 527	$ 1,245
11	2024	$ -	$ 443	$ -	$ -	$ 394	$ 676	$ 1,513
12	2025	$ -	$ 505	$ -	$ -	$ 455	$ 834	$ 1,794
13	2026	$ 52	$ 519	$ -	$ -	$ 519	$ 1,000	$ 2,090
14	2027	$ 80	$ 534	$ -	$ -	$ 534	$ 1,174	$ 2,321
15	2028	$ 110	$ 548	$ -	$ -	$ 548	$ 1,357	$ 2,563
16	2029	$ 169	$ 563	$ -	$ -	$ 563	$ 1,549	$ 2,845
17	2030	$ 232	$ 579	$ -	$ -	$ 579	$ 1,592	$ 2,981
18	2031	$ 297	$ 595	$ -	$ -	$ 595	$ 1,636	$ 3,123
19	2032	$ 367	$ 611	$ -	$ -	$ 611	$ 1,681	$ 3,270
20	2033	$ 440	$ 628	$ -	$ -	$ 628	$ 1,727	$ 3,422
21	2034	$ 516	$ 645	$ -	$ -	$ 645	$ 1,774	$ 3,581
22	2035	$ 530	$ 663	$ -	$ -	$ 663	$ 1,641	$ 3,497
23	2036	$ 545	$ 681	$ -	$ -	$ 681	$ 1,686	$ 3,593
24	2037	$ 560	$ 700	$ -	$ -	$ 700	$ 1,540	$ 3,500
25	2038	$ 575	$ 719	$ -	$ -	$ 719	$ 1,582	$ 3,596
26	2039	$ 591	$ 739	$ -	$ -	$ 739	$ 1,422	$ 3,492
27	2040	$ 607	$ 759	$ -	$ -	$ 759	$ 1,462	$ 3,588
28	2041	$ 624	$ 780	$ -	$ -	$ 780	$ 1,287	$ 3,472
29	2042	$ 641	$ 802	$ -	$ -	$ 802	$ 1,323	$ 3,567
30	2043	$ 618	$ 824	$ -	$ -	$ 824	$ 1,133	$ 3,398
31	2044	$ 635	$ 846	$ -	$ -	$ 846	$ 1,164	$ 3,491
32	2045	$ 609	$ 870	$ -	$ -	$ 870	$ 957	$ 3,304
33	2046	$ 625	$ 893	$ -	$ -	$ 893	$ 983	$ 3,395
34	2047	$ 597	$ 918	$ -	$ -	$ 918	$ 757	$ 3,190
35	2048	$ 613	$ 943	$ -	$ -	$ 943	$ 778	$ 3,278
36	2049	$ 582	$ 969	$ -	$ -	$ 969	$ 533	$ 3,053
37	2050	$ 598	$ 996	$ -	$ -	$ 996	$ 548	$ 3,137
38								
SUM 12+		$ 11,812	$ 20,894	$ -	$ -	$ 20,567	$ 34,955	$ 88,229
SUM 12-21		$ -	$ 911	$ -	$ -	$ 778	$ 249	$ 1,939
SUM 22-50		$ 11,812	$ 19,983	$ -	$ -	$ 19,789	$ 34,706	$ 86,290
NPV 12+		**$1,398**	**$3,581**	**$0**	**$0**	**$3,439**	**$6,198**	**$14,616**
NPV 12-21		**$0**	**$485**	**$0**	**$0**	**$418**	**$117**	**$1,019**
NPV 22-50		**$1,398**	**$3,096**	**$0**	**$0**	**$3,021**	**$6,081**	**$13,596**

APPENDIX C.

WEALTH MANAGEMENT CALCULATIONS

	WEALTH MANAGEMENT CALCULATION (Billion $)		
		1-Mar-12	Fiscal Year 2012 Calculation
1	General Fund Revenue	$ 8.93	
2	Petroleum	$ 8.22	fall 2011 projection for FY2012
3	Investment Earnings	$ 0.18	fall 2011 projection for FY2012
4	Other	$ 0.54	fall 2011 projection for FY2012
5	Spending	$ 7.53	
6	General Fund	$ 6.88	FY2012 Enacted less vetoes, pre-transfer authorization from Governor's proposed FY2013 Budget, OMB (with place holder for FY2012 Supplementals)
7	PF Dividend	$ 0.65	APFC, Financial History and Projections, in Monthly Financial statement, Dec 2011, for 2012
8	Financial Assets	**$ 55.0**	
9	Perm Fund	$ 40.0	APFC May 2011 Balance Sheet, net dividend
10	Other	$ 15.0	Office of Governor Press Release 11-114
11	Petroleum in Ground	**$ 99.6**	
12	Conventional North Slope--State Lands	$ 73.0	fall 2011 DOR projection from FY2012 forward
13	Other Oil	$ 14.6	author estimate
14	Gas	$ 11.9	author estimate
15	**PETROLEUM NEST EGG**	**$ 154.6**	
16	Real Earnings	$ 7.73	
17	Rate of Return net Population Growth	4%	
18	**MAXIMUM SUSTAINABLE YIELD--Real Earnings net of Population Growth**	**$ 6.18**	
19	General Fund Spend from Wealth Portfolio	$ 6.34	
20	GF Petroleum Revenues Spent (6-3-4)	$ 6.17	
21	GF Investment Earnings Spent	$ 0.18	
22	PF Dividend Spend from Wealth Portfolio	$ 0.65	
23	**OUTGO--Spend from Petroleum Wealth (19+22)**	**$ 7.00**	
24	**FISCAL BURDEN or Overdraw (23-18)**	**$ 0.81**	
25	Percent Overdraw	13%	
	Per Capita (Thousand $)		
	Petroleum Nest Egg	**$ 212**	
	MSY	**$ 8.480**	
	Spend	**$ 9.597**	
	Fiscal Burden	**$ 1.117**	
	Current Petroleum Revenues Actual	**$ 8.22**	
	Spent	$ 6.17	
	Saved	$ 2.05	
	Current Petroleum Revenues for MSY	**$ 8.22**	
	Spend	$ 5.35	
	Save	$ 2.86	
	Portfolio Needed for Spend =MSY (Billion $)	**$ 175**	
	Financial Assets	**$ 55**	
	Petroleum in the Ground	**$ 120**	
	ASSUMPTIONS		
	real investment return 5%		
	population growth 1%		
	pc real spend growth 0%		
	population (000) 729		

APPENDIX D.

MAXIMUM SUSTAINABLE YIELD: SENSITIVITY TO BANKABLE PETROLEUM AND REAL INVESTMENT RETURN

	Maximum Sustainable Yield				
		Real Investment Return			
		3%	4%	5%	6%
	$ 50	$ 2.1	$ 3.2	$ 4.2	$ 5.3
Bankable Petroleum (Billion $)	$ 60	$ 2.3	$ 3.5	$ 4.6	$ 5.8
	$ 70	$ 2.5	$ 3.8	$ 5.0	$ 6.3
	$ 80	$ 2.7	$ 4.1	$ 5.4	$ 6.8
	$ 90	$ 2.9	$ 4.4	$ 5.8	$ 7.3
	$ 100	$ 3.1	$ 4.7	**$6.2**	$ 7.8
	$ 110	$ 3.3	$ 5.0	$ 6.6	$ 8.3
	$ 120	$ 3.5	$ 5.3	$ 7.0	$ 8.8
	$ 130	$ 3.7	$ 5.6	$ 7.4	$ 9.3
	$ 140	$ 3.9	$ 5.9	$ 7.8	$ 9.8
	$ 150	$ 4.1	$ 6.2	$ 8.2	$ 10.3
	$ 160	$ 4.3	$ 6.5	$ 8.6	$ 10.8
	$ 170	$ 4.5	$ 6.8	$ 9.0	$ 11.3
	$ 180	$ 4.7	$ 7.1	$ 9.4	$ 11.8
	$ 190	$ 4.9	$ 7.4	$ 9.8	$ 12.3
	$ 200	$ 5.1	$ 7.7	$ 10.2	$ 12.8

APPENDIX E

DATA SOURCES FOR TRACKING STATE FISCAL PERFORMANCE

Non Petroleum and Petroleum Revenues (Value of Petroleum in the Ground)

Alaska Department of Revenue, Tax Division, Revenue Sources Book
http://www.tax.alaska.gov/programs/sourcebook/index.aspx
http://www.tax.alaska.gov//programs/documentviewer/viewer.aspx?2321f

Permanent Fund Balance and Permanent Fund Dividend

Monthly Financial Report, last page
http://www.apfc.org/home/Content/publications/reportArchive.cfm
http://www.apfc.org/_amiReportsArchive/APFC201108.pdf

Constitutional Budget Reserve and General Fund Balances

Alaska Department of Revenue, Treasury Division
http://www.revenue.state.ak.us/treasury

General Fund Spending

Office of Management and Budget webpage as the enacted Budget Summary, page 1
http://omb.alaska.gov/
http://omb.alaska.gov/ombfiles/12_budget/PDFs/FiscalSummary_6-29-11.pdf